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351.5 Officers' Retirement  
P37mpay System actuarial  
1992 valuation as of July  
1, 1992



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**MUNICIPAL POLICE OFFICERS' RETIREMENT SYSTEM**

**STATE OF MONTANA**

**ACTUARIAL VALUATION**

**AS OF JULY 1, 1992**

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ACTUARIAL CONSULTANTS



Municipal Police Officers' Retirement System

State of Montana

Actuarial Valuation

As of July 1, 1992



# Municipal Police Officers' Retirement System

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# Municipal Police Officers' Retirement System

## Section I

### Introduction

An actuarial valuation of the Municipal Police Officers' Retirement System of the State of Montana has been completed as of July 1, 1992. This valuation was authorized by the Public Employees' Retirement Board under Section 19-9-504, MCA. The purpose of the valuation was to determine the financial position of the fund, the normal cost, and the unfunded accrued liability based upon present and prospective assets and liabilities of the system as of July 1, 1992.

Section II presents an analysis of the results of the actuarial valuation. The numerical findings and membership data supporting this analysis are shown in Section III.

In conducting the actuarial valuation, certain assumptions were made as to the future experience of the system. A summary and discussion of each of the assumptions is contained in Section IV.

The valuation is based upon the Municipal Police Officers' Retirement Act and incorporates all amendments as of July 1, 1992. A summary of the major provisions of the Act is contained in Section V.

### Actuarial Certification

The results of the actuarial valuation shown in this report are based upon information provided by the Public Employees' Retirement Division regarding plan participants, plan assets and other matters. The values have been calculated on the basis of actuarial assumptions which, in my opinion, are appropriate for purposes of this valuation.

This valuation has been prepared in accordance with generally accepted actuarial principles and practices and, to the best of my knowledge, fairly reflects the actuarial position of the Municipal Police Officers' Retirement System as of July 1, 1992.



Alton P. Hendrickson  
Member, American Academy  
of Actuaries



# Municipal Police Officers' Retirement System

## Section II

### Analysis of Valuation

#### Results of Valuation

An actuarial valuation has been conducted for the Municipal Police Officers' Retirement System as of July 1, 1992. This valuation has determined that the percent of each member's compensation required to fund the benefits as they accrue in the future is 23.40%. The regular contribution rate of 38.20% allows 14.80% to be applied to the unfunded past service liability. This percent is sufficient to amortize the unfunded past service liability over a period of 24.71 years. This period has decreased from 26.19 years in 1990.

#### Asset Valuation

Past actuarial valuations have valued assets at market value, with gain and loss fluctuations smoothed over a 6-year period. This procedure has been conservative and slow to recognize recent market performance. The current actuarial valuation has accelerated the rate at which gains and losses are recognized by smoothing the fluctuations over a shorter period of 4 years. The table below illustrates this valuation procedure:

	Actual		Adjusted
	-----		-----
Cost Value as of 6/30/92	41,302,748		41,302,748
1992 Market Gain	2,075,421	x .25	518,855
1991 Market Gain	652,631	x .50	326,316
1990 Market Gain	-150,597	x .75	-112,948
Prior Market Gain	2,012,580	x 1.00	2,012,580
	-----		-----
Market Value as of 6/30/92	45,892,783		44,047,551

#### Investment Performance

The rate of investment return during 1991-92 was 13.19% on a market value basis and 8.58% on a cost value basis. These rates were based on all assets of the system including accruals, and assumed uniform fund activity throughout the year.

#### Benefits and Contributions

As of July 1, 1991, benefits were improved to allow members to retire after 20 years of service regardless of age. This improvement was funded by an increase in the state contribution rate from 15.06% of compensation to 15.66%. The cities contribution rate increased from 13.02% to 13.92%.

Supplemental minimum benefits are provided to recipients. The cost of these supplements is paid by the state auditor from the state fire insurance premium



tax fund. This valuation did not include the cost of the supplements provided from the premium tax fund. The supplemental payment for 1991-92 was \$1,214,965.

### Amortization of The Unfunded Liability

An amortization schedule has been prepared as part of each biennial valuation to amortize new liability gains and losses over a 40-year period. The amortization period of past liabilities decreases 2 years with each valuation. The schedule began with an initial liability established on July 1, 1984.

The Public Employees' Retirement Board has set a goal of funding liabilities over a period not to exceed 30 years. The schedule in this report illustrates the rate required to fund each valuation's new liabilities over a 30-year period.

### Actuarial Assumptions

The actuarial assumptions used in the valuation of July 1, 1990 were continued in this valuation. A review of the system's data and experience did not reveal any deviations which warranted a change.

### Summary of Data

The active membership was 453 on July 1, 1992 which was an increase of 19 members from July 1, 1990. The annual payroll increased from \$10.50 to \$11.40 million during the biennium. The average pay per member grew at the rate of 2.0% per year.

The average active member is 37.0 years of age, was employed at age 27.2, has completed 9.9 years of service, and earns \$25,171.

The number of members receiving benefits was 436 on July 1, 1992 which was an increase of 14 member from July 1, 1990. The annual benefit payout increased from \$4.68 to \$5.29 million during the biennium. The benefit payout per member stayed level.

The average retiree is 65.1 years of age, retired at age 48.5 with 21.5 years of service, and receives a benefit of \$1,031 per month.

### Conclusion

Mainly because of improved benefits, the system's total liability grew by 26.7%. This was offset by a 21.7% growth in assets. The current funding level allows the system's unfunded liability to be funded over 21.72 years compared to 26.19 years in 1990. Part of this decrease is attributable to smoothing market value changes over 4 years rather than 6.

Based on the results of this valuation, the Municipal Police Officers' Retirement System is actuarially sound.



Municipal Police Officers' Retirement System

Section III

Schedule 1

Normal Cost Allocation

(1) Normal Cost Contribution Rate:

(a) Retirement	21.29%
(b) Death	0.54
(c) Disability	0.94
(d) Vested	0.40
(e) Withdrawals	0.18
	-----
(f) Total Rate	23.35%

(2) Present Value of Future Salaries  
Of Current Members \$ 79,726,763

(4) Present Value of Future Normal Costs  
For Current Members (1(f) \* (2)) \$ 18,616,199





Municipal Police Officers' Retirement System

Schedule 2

Present Value of Benefits

(1) Present Value of Benefits - Inactive Members

(a) Retirement	\$ 31,762,016
(b) Death	2,358,689
(c) Disability	8,573,707
(d) Withdrawals	114,386
	-----
(e) Total Inactive	\$ 42,808,798

(2) Present Value of Benefits - Active Members

(a) Retirement	\$ 52,333,702
(b) Death	749,201
(c) Disability	1,302,709
(d) Vested	634,598
(e) Withdrawals	185,485
	-----
(f) Total Active	\$ 55,205,695

(3) Total Liabilities \$ 98,014,493



Municipal Police Officers' Retirement System

Schedule 3

Liability Allocation and Statutory Funding

(1) Unfunded Past Service Liability

(a) Present Value of Benefits	\$ 98,014,493
(b) Present Value of Future Normal Costs	\$ 18,616,199
(c) Fund Assets	\$ 44,047,551
	-----
(d) Unfunded Liability (a)-(b)-(c)	\$ 35,350,743

(2) Contribution Rates Amortized over 24.71 Years

(a) Present Value of Salaries During Next 24.71 Years	\$ 238,052,142
(b) Unfunded Contribution Rate (1(d)/2(a))	14.85%
(c) Normal Cost Rate (Schedule 1)	23.35
	-----
(d) Statutory Funding Rate	38.20%



# Municipal Police Officers' Retirement System

## Schedule 4

### Unfunded Liability Amortization Schedule

#### (1) Biennial Unfunded Past Service Liability Accounts

1984 Liability Account as of 7/1/90	\$	40,912,014
Interest Charge on Liability Account		6,807,759
Contributions Applied to Liability		2,940,906
Interest Credit on Contributions		226,809
1984 Liability Account as of 7/1/92	\$	44,552,058
1986 Liability Account as of 7/1/90	\$	-920,243
Interest Charge on Liability Account		-153,128
Contributions Applied to Liability		-66,150
Interest Credit on Contributions		-5,102
1986 Liability Account as of 7/1/92	\$	-1,002,119
1988 Liability Account as of 7/1/90	\$	-2,522,227
Interest Charge on Liability Account		-419,699
Contributions Applied to Liability		-181,307
Interest Credit on Contributions		-13,983
1988 Liability Account as of 7/1/92	\$	-2,746,636
1990 Liability Account as of 7/1/90	\$	-3,506,323
Interest Charge on Liability Account		-583,452
Contributions Applied to Liability		-252,047
Interest Credit on Contributions		-19,438
1990 Liability Account as of 7/1/92	\$	-3,818,290

#### (2) Actuarial Gain/Loss

Current Unfunded Liability (Schedule 3)	\$	35,350,743
Less 1984 Liability Account		44,552,058
Less 1986 Liability Account		-1,002,119
Less 1988 Liability Account		-2,746,636
Less 1990 Liability Account		-3,818,290
		-----
1992 Liability Account as of 7/1/92	\$	-1,634,270

#### (3) Required Contribution Rate

Normal Cost Rate (Schedule 1)	23.35%
Rate to Fund 1984 Liability Over 22 Years	20.64
Rate to Fund 1986 Liability Over 24 Years	-0.43
Rate to Fund 1988 Liability Over 26 Years	-1.11
Rate to Fund 1990 Liability Over 28 Years	-1.45
Rate to Fund 1992 Liability Over 30 Years	-0.59
	-----
Contribution Rate for 30-Year Schedule	40.41%



# Municipal Police Officers' Retirement System

## Schedule 5

Table 1

### Comparison of Valuations

	1990	1992
(1) Unfunded Past Service Liability		
(a) Present Value of Benefits	\$ 89,334,643	\$ 98,014,493
(b) Present Value of Future Costs	\$ 19,165,674	\$ 18,616,199
(c) Fund Assets	\$ 36,205,748	\$ 44,047,551
(d) Unfunded Liability	\$ 33,963,221	\$ 35,350,743
(2) Amortization Period and Contribution Rates		
(a) Years for Amortization	26.19	24.71
(b) Unfunded Contribution Rate	14.76%	14.85%
(c) Normal Cost Rate	20.70%	23.35%
(d) Statutory Funding Rate	35.46%	38.20%
(3) Active Members		
(a) Number of Members	434	453
(b) Annual Payroll	\$ 10,500,176	\$ 11,402,679
(c) Average Annual Salary	\$ 24,194	\$ 25,171
(4) Inactive Members		
(a) Number of Retired	297	312
(b) Number of Disabled	96	99
(c) Number of Survivors	29	25
(d) Number of Vested Deferred	0	2
(e) Annual Benefits	\$ 4,683,008	\$ 5,292,491
(f) Average Monthly Benefit	\$ 1,016	\$ 1,012





# Municipal Police Officers' Retirement System

Table 2

## Comparison of Active Members

City	1990		1992	
	Active Members	Annual Salary	Active Members	Annual Salary
Anaconda	16	\$ 349,304	20	\$ 439,084
Baker	4	\$ 94,639	4	\$ 67,314
Billings	103	\$ 2,585,625	99	\$ 2,615,451
Bozeman	24	\$ 609,531	28	\$ 662,468
Butte	39	\$ 1,052,661	40	\$ 1,015,982
Glasgow	6	\$ 127,105	7	\$ 164,745
Glendive	12	\$ 247,177	10	\$ 229,937
Great Falls	56	\$ 1,417,538	64	\$ 1,720,405
Havre	15	\$ 320,989	17	\$ 386,181
Helena	36	\$ 828,619	38	\$ 907,333
Kalispell	23	\$ 598,622	23	\$ 617,394
Lewistown	10	\$ 190,811	10	\$ 206,661
Livingston	10	\$ 189,291	9	\$ 172,998
Miles City	13	\$ 278,496	13	\$ 318,293
Missoula	60	\$ 1,489,307	65	\$ 1,764,051
Plains	1	\$ 20,424	1	\$ 22,272
Red Lodge	6	\$ 100,037	5	\$ 92,110
Total	434	\$10,500,176	453	\$11,402,679



# Municipal Police Officers' Retirement System

Table 3

## Comparison of Members Receiving Benefits

City	1990		1992	
	Inactive Members	Annual Benefit	Inactive Members	Annual Benefit
Anaconda	23	\$ 258,100	24	\$ 287,307
Baker	1	\$ 8,770	1	\$ 8,770
Billings	83	\$ 919,927	85	\$ 1,023,551
Bozeman	16	\$ 180,116	18	\$ 224,957
Butte	60	\$ 679,215	61	\$ 765,599
Glasgow	4	\$ 40,938	4	\$ 45,420
Glendive	7	\$ 72,966	8	\$ 88,224
Great Falls	74	\$ 853,972	71	\$ 867,869
Havre	16	\$ 154,125	16	\$ 167,840
Helena	29	\$ 326,688	30	\$ 374,894
Kalispell	19	\$ 215,878	21	\$ 284,767
Lewistown	10	\$ 86,145	11	\$ 106,259
Livingston	9	\$ 85,921	10	\$ 97,831
Miles City	19	\$ 188,832	19	\$ 206,494
Missoula	50	\$ 595,659	55	\$ 724,897
Red Lodge	2	\$ 15,756	2	\$ 17,812
Total	422	\$ 4,683,008	436	\$ 5,292,491



# Municipal Police Officers' Retirement System

## Schedule 6

Table 1

### Number of Active Members

Years of Service	Member's Age									Total
	20-25	25-29	30-34	35-39	40-44	45-49	50-54	55-59	OVER 60	
0-4	27	48	52	17	14	3				161
5-9		13	33	25	7			1		79
10-14			12	29	21	6	2	1		71
15-19				23	52	18	3	1	1	98
20-24					15	20	4	1		40
25-29							2	1	1	4
30-34										
35-39										
40-UP										
Total	27	61	97	94	109	47	11	5	2	453



# Municipal Police Officers' Retirement System

Table 2

## Average Salaries of Active Members

Years of Service	Member's Age									Total
	20-25	25-29	30-34	35-39	40-44	45-49	50-54	55-59	OVER 60	
0-4	15757	18096	20922	20876	22341	25577				19419
5-9		24224	25488	25252	24565			26521		25136
10-14			25816	26411	26975	30982	27449	22272		26835
15-19				30255	29342	31763	28743	28098	30153	29978
20-24					33781	32606	33951	35134		33244
25-29							34708	10577	37614	29402
30-34										
35-39										
40-UP										
Total	15757	19402	23081	26042	28291	31627	31486	24520	33884	25171





# Municipal Police Officers' Retirement System

Table 3

Number of Vested Inactive Members

Years of Service	Member's Age									Total
	20-25	25-29	30-34	35-39	40-44	45-49	50-54	55-59	Over 60	
0-4										
5-9										
10-14				1						1
15-19										
20-24						1				1
25-29										
30-34										
35-39										
40-UP										
Total				1		1				2



# Municipal Police Officers' Retirement System

Table 4

## Number of Retired Members

Member's Service	Recipient's Age									Total
	< 45	45-49	50-54	55-59	60-64	65-69	70-74	75-79	Over 80	
0-4										
5-9								1		1
10-14			1					1		2
15-19						1	3	4	5	13
20-24	7	30	28	41	41	44	25	18	26	260
25-29			2	6	3	5	2	1	7	26
30-34				1	3	1	1	1	2	9
35-39						1				1
40-UP										
Total	7	30	31	48	47	52	31	26	40	312



# Municipal Police Officers' Retirement System

Table 5

## Average Benefits of Retired Members

Member's Service	Recipient's Age									Total
	< 45	45-49	50-54	55-59	60-64	65-69	70-74	75-79	Over 80	
0-4										
5-9								1010		1010
10-14			635					1010		823
15-19						974	958	935	879	922
20-24	1296	1266	1126	1040	955	907	931	902	915	1014
25-29			1418	1647	959	1066	987	1010	911	1165
30-34				1736	1462	1010	1376	964	917	1256
35-39						1783				1783
40-UP										
Total	1296	1266	1129	1130	987	943	952	922	910	1031



# Municipal Police Officers' Retirement System

Table 6

## Number of Disabled Members

Member's Service	Recipient's Age									Total
	< 45	45-49	50-54	55-59	60-64	65-69	70-74	75-79	Over 80	
0-4	2	1	1							4
5-9	1	4	4	2	2		4	1		18
10-14	10	3	6	3	6	2	2	1	4	37
15-19	1	2	3	2	3	4	2	1	2	20
20-24				3	2	3	1	4	3	16
25-29							1	1		2
30-34								1	1	2
35-39										
40-UP										
Total	14	10	14	10	13	9	10	9	10	99





# Municipal Police Officers' Retirement System

Table 7

## Average Benefits of Disabled Members

Member's Service	Recipient's Age									Total
	< 45	45-49	50-54	55-59	60-64	65-69	70-74	75-79	Over 80	
0-4	910	933	947							925
5-9	902	985	956	898	902		957	1004		950
10-14	987	998	937	937	948	992	984	1010	925	964
15-19	1169	1258	997	1012	948	916	860	947	953	989
20-24				1010	1134	984	974	989	861	985
25-29							1010	1010		1010
30-34								745	1010	878
35-39										
40-UP										
Total	983	1038	956	966	970	955	950	964	920	967



# Municipal Police Officers' Retirement System

Table 8

## Number of Survivors

Member's Service	Recipient's Age									Total
	< 45	45-49	50-54	55-59	60-64	65-69	70-74	75-79	Over 80	
0-4	3			1		1				5
5-9	2	3		1	3				1	10
10-14	1								1	2
15-19		1	1		1	1			1	5
20-24							1			1
25-29										
30-34									2	2
35-39										
40-UP										
Total	6	4	1	2	4	2	1		5	25



# Municipal Police Officers' Retirement System

Table 9

## Average Benefits of Survivors

Member's Service	Recipient's Age									Total
	< 45	45-49	50-54	55-59	60-64	65-69	70-74	75-79	Over 80	
0-4	982			947		1010				981
5-9	945	970		1010	989				947	973
10-14	844								731	787
15-19		962	1176		902	1010			742	958
20-24							742			742
25-29										
30-34									992	992
35-39										
40-UP										
Total	947	968	1176	979	967	1010	742		881	949



## Municipal Police Officers' Retirement System

### Section IV

#### Actuarial Funding Method

The cost of the retirement system will be determined by its future experience. In calculating the financial requirements of the fund, certain assumptions were made as to the expected future experience. This section summarizes the funding method applied as well as the actuarial assumptions used.

Any variations in the actual experience of the fund from those assumed in this valuation may cause changes in the projected future costs of the fund. It is therefore necessary that the actuarial assumptions be reviewed from time to time with adjustments as experience warrants. It is also important that regular valuations be performed to determine the financial effect of variations between the actual and assumed experience.

The assumptions used in the valuation are based upon the past experience of the fund together with projections as to future experience.

The method of funding employed is commonly referred to as the entry age normal cost method. This method establishes a normal cost as well as an unfunded accrued liability. The normal cost is the level percentage of total salaries required to fund the benefits, assuming this percentage has been contributed since each member's entry into the fund.

The unfunded accrued liability represents the excess of the present value of total liabilities over the present value of the fund assets and the present value of expected future contributions at the normal cost rate.

In order to maintain the fund on an actuarially sound basis, the rate of contribution should be such as to provide for the normal cost in addition to making progress towards the amortization of the unfunded liability.





## Municipal Police Officers' Retirement System

### Discussion of Actuarial Assumptions

#### Mortality Rates

The mortality rates for males and females are based upon the 1983 Group Annuity Mortality Table, and apply to both active members and those receiving benefits.

#### Disability Rates

The disability rates for males and females are based upon the 1983 Disability Table, adjusted to reflect the higher rates experienced by the members.

#### Withdrawal Rates

The withdrawal rates are based upon the actual experience of the system as determined in the 1987 withdrawal experience study.

#### Salary Scale

The rates of salary increase are based upon an assumed compounded growth rate of 6.5% per annum.

#### Investment Earnings

It was assumed that the investment earnings would be 8% compounded annually.

#### Asset Valuation

The assets are based on market value, with gains and losses graduated over a 4-year period.

#### Administrative Expenses

It was assumed that the system would incur no administrative expenses beyond those provided by investment earnings in excess of 8%.

#### Termination Benefits

It was assumed that all members terminating with less than ten years of service would receive an immediate withdrawal of their member contributions with interest. It was further assumed that members with ten or more years of service would select the most advantageous benefits under the given assumptions.



## Municipal Police Officers' Retirement System

### Illustration of Actuarial Assumptions

#### Mortality Rates

The mortality rates are based upon the 1983 Group Annuity Mortality Table.

Age	Deaths Per 10,000 Male Members	Deaths Per 10,000 Female Members
25	5	3
30	6	3
35	9	5
40	12	7
45	22	10
50	39	16
55	61	25
60	92	42
65	156	71
70	275	124
75	446	240
80	741	429
85	1,148	699

#### Disability Rates

The disability rates are based upon the 1983 Disability Table, adjusted to reflect the higher rates experienced by the members.

Age	Disabilities per 10,000 Male Members	Disabilities per 10,000 Female Members
25	3	3
30	6	9
35	9	15
40	18	27
45	36	45
50	60	66
55	153	123
60	314	260



### Withdrawal Rates

The withdrawal rates illustrated below reflect the turnover experienced by the Municipal Police Officers' Retirement System.

Age	Withdrawals Per 10,000 Active Members
25	648
30	386
35	169
40	39
45	21
50	0

### Salary Scale

The salary increases are based upon an assumed compounded growth rate of 6.5% per annum.

### Investment Earnings

Future investment earnings are assumed to be 8% compounded annually.

### Asset Valuation

The assets are based on market value, with gains and losses graduated over a 4-year period.

### Administrative Expenses

It was assumed that the administrative expenses would be recovered by investment earnings in excess of 8%.



## Municipal Police Officers' Retirement System

### Section V

#### Summary of Benefits and Contributions

Employee Contributions -	The percent of compensation is 6% for members employed prior to July 1, 1975, 7.2% for members employed after June 30, 1975 and 8.7% for members employed after June 30, 1979.
City Contributions -	13.92% of members' compensation.
State Contribution -	15.66% of members' compensation.
Retirement Benefit -	<p>Eligibility: 20 years of service regardless of age.</p> <p>Normal Form: Life payments, with full benefits continuing to the surviving spouse or dependent children upon the member's death.</p> <p>Benefit: 2.5% of the final compensation for each of the first 20 years of service plus 1% for each of the next 10 years.</p>
Disability Benefit -	Minimum of 50% of final compensation.
Death Benefit -	Minimum of 50% of final compensation.
Termination Benefit -	Prior to 10 years of service, return of member contributions. After 10 years, the member may elect to receive the accrued benefit at age 50.
Benefit Adjustments -	<p>If the benefits are less than one-half of the monthly salary paid to a newly confirmed police officer in the city in which the member was employed, the monthly payments are to be increased to one-half of such monthly salary.</p> <p>The cost of this adjustment is paid from the fire insurance premium tax fund.</p>





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